



# As We May Think

The Legacy of Computing Research and the Power of Human Cognition

Elizabeth D. Mynatt

Executive Director, Institute for People and Technology

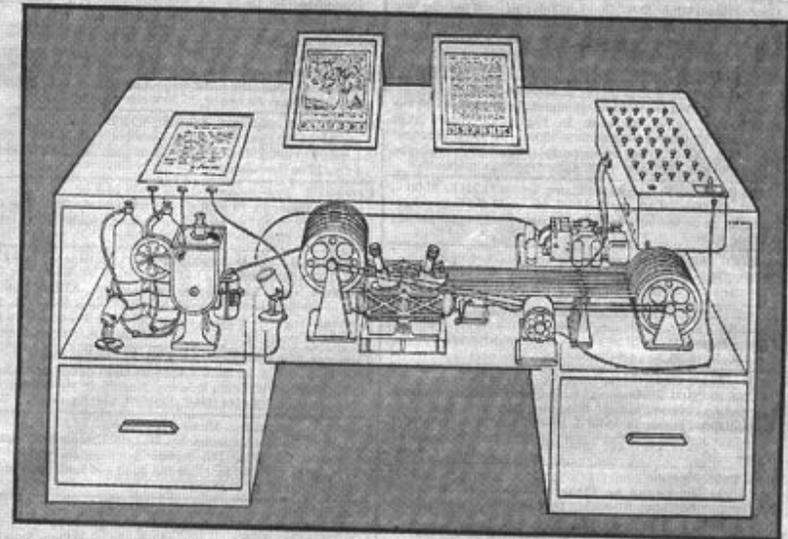
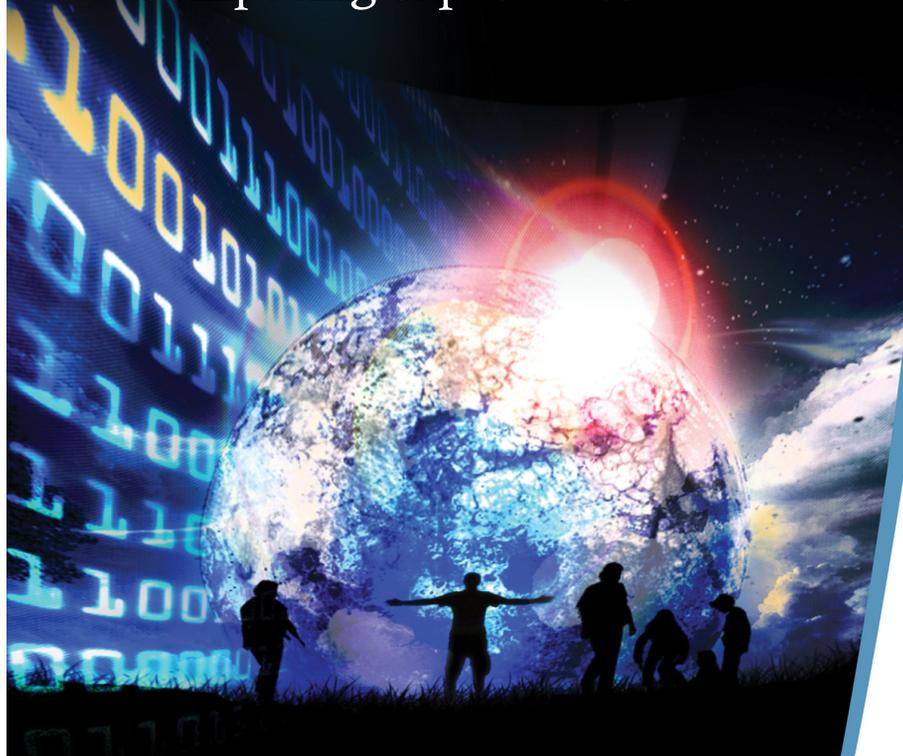
Professor, Interactive Computing

Georgia Institute of Technology

**Georgia**  **Institute for People**  
**Tech** **and Technology**

# Augmenting Human Cognition

Assessment of post WW2  
computing capabilities.



MEMEX in the form of a desk would instantly bring files and material on any subject to the operator's fingertips. Slanting translucent viewing screens magnify supermicrofilm filed by code numbers. At left is a mechanism which automatically photographs longhand notes, pictures and letters, then files them in the desk for future reference.

## AS WE MAY THINK CONTINUED

index. Any given book of his library can thus be called up and consulted with far greater facility than if it were taken from a shelf. As he has several projection positions, he can leave one item in position while he calls up another. He can add marginal notes and comments, taking advantage of one possible type of dry photography, and it could even be arranged so that he can do this by a stylus scheme, such as is now employed in the telautograph seen in railroad waiting rooms, just as though he had the physical page before him.

## BUILDING "TRAILS" OF THOUGHT ON THE MEMEX—

Wie sich 1945 ein LIFE-Zeichner die erste Hypertextmaschine (Memex) vorstellte

# Augmenting Human Cognition

Stanford's Augmentation  
Research Center



monday afternoon

december 9

3:45 p.m. / arena

*Chairman:*

**DR. D. C. ENGELBART**

*Stanford Research Institute  
Menlo Park, California*

## a research center for augmenting human intellect

This session is entirely devoted to a presentation by Dr. Engelbart on a computer-based, interactive, multiconsole display system which is being developed at Stanford Research Institute under the sponsorship of ARPA, NASA and RADC. The system is being used as an experimental laboratory for investigating principles by which interactive computer aids can augment intellectual capability. The techniques which are being described will, themselves, be used to augment the presentation.

The session will use an on-line, closed circuit television hook-up to the SRI computing system in Menlo Park. Following the presentation remote terminals to the system, in operation, may be viewed during the remainder of the conference in a special room set aside for that purpose.

# Augmenting Human Cognition

## Visual tools

Example ViewPoint Document

Close Save Reset Save&Edit

12294 Free Disk Pages Help

### XEROX 6085 Workstation

#### User-Interface Design

To make it easy to compose text and graphics, to do electronic filing, printing, and mailing all at the same workstation, requires a revolutionary user interface design.

**Bit-map display** - Each of the pixels on the 19" screen is mapped to a bit in memory, thus, arbitrarily complex images can be displayed. The 6085 displays all fonts and graphics as they will be printed. In addition, familiar office objects such as documents, folders, file drawers and in-baskets are portrayed as recognizable images.

**The mouse** - A unique pointing device that allows the user to quickly select any text, graphic or office object on the display.

#### See and Point

All functions are visible to the user on the keyboard or on the screen. The user does filing and retrieval by selecting them with the mouse and touching the MOVE, COPY, DELETE or PROPERTIES command keys. Text and graphics are edited with the same keys.

Year	Man 6085	6085
1978	85.2	15.8
1980	41.1	39.9
1982	45	55
1984	30	70
1986	10	90
1988	5	95

Table 1: Percentages of use of methods.

Activity under the old and the new

Figure 1: Data from Table 1 drive

Workstation usage percentages Table 1 and illustrated in Figure 6085 users are likely to do text composition and layout, control process including printing and di

#### Text and Graphics

To replace typesetting, the 6085 offers a choice of type fonts and sizes, from 6 point to 36 point.

Here is a sentence of 14 point text.  
Here is a sentence of 12 point text.  
18-point text.  
24-point text.

9:27:24  
10-29-88  
N.H.

Local Kevin J. Outbasket

Mail Merge Mail from Ken

Brother Dominic

Calendar Calc Loader

Blank User Dictionary Empty Dictionary Blank Record File

Blank Document

Blank Folder

Blank Canvas

Blank Book

Remote Files

Blank Reference

2.0 Beechnut

ILLUS

C Tools

Blank Illustration

Blank Canvas

PC Converter

Blank Shared Book

Blank Book

Emulator

Virtual Rigid Disk

Virtual Floppy

Example ViewPo

Remote Files

Swaps

DOS & Lotus

1427 Blank Reference

Drawers in Japan

DOS & Lotus data

NAME	EXTENSION	SIZE	DATE
COMMAND	COM	22677	15-8
ANSI	SYS	2556	18-8
ASSIGN	COM	864	28-8
ATTRIB	EXE	15091	14-8
BACKUP	COM	17024	28-4
CHKDSK	COM	9435	24-8
CHMOD	COM	6528	27-4
COMP	COM	3018	10-8
DEBUG	EXE	15364	15-8

KEYBOARD: select, move, copy objects

MOUSE: select objects, mouse

DISPLAY: see office objects

Shorter Production Times

Experience at Xerox with prototype work stations has shown shorter production times and

# Augmenting Human Cognition

## Desktop publishing

The screenshot displays the Scribus desktop publishing application interface. The main workspace shows a multi-column layout for a Renault Clio III advertisement. The layout includes a Renault logo, the text "Clio III", the slogan "More than ever, the small car with big car refinements", a large image of a silver Clio III, and a smaller image of two Clio III cars (one red, one silver). A "Story Editor" window is open on the right, showing the text for the advertisement. The text in the Story Editor reads: "Following the launch of Modus in 2004, Renault continues the renewal and development of its B-segment range with Clio III. The new car marks the beginning of a new chapter of the Clio story which began in 1990 and which has continued to ride a wave of success ever since. The third generation of the market-leading model stands out as a new benchmark in its segment. Bigger and roomier, Clio III places the accent on driving pleasure..."

**Renault** renault.com

## Clio III

More than ever, the small car with big car refinements

**EURO NCAP ★★★★★**

Following the launch of Modus in 2004, Renault continues the renewal and development of its B-segment range with Clio III. The new car marks the beginning of a new chapter of the Clio story which began in 1990 and which has continued to ride a wave of success ever since. The third generation of the market-leading model stands out as a new benchmark in its segment. Bigger and roomier, Clio III places the accent on driving pleasure...

**The power of seduction**

Clio III's soft, sensual lines highlight the car's dynamism and hint at driving pleasure. The warm and capably finished interior takes up to five people in comfort and, in precise response to customer demand, the new model can be ordered in a choice of different interior trim levels and three...

...lanned by the brightness of the interior which synthesises a set of numerous previously used in this category. The driving pleasure and user-friendly controls contribute to making the driver feel pretty easy. Numerous other comfort and safety features are also available, including the... the car - are totally new to this segment.

**Driving pleasure takes**

Following the launch of Modus in 2004, Renault continues the renewal and development of its B-segment range with Clio III. The new car marks the beginning of a new chapter of the Clio story which began in 1990 and which has continued to ride a wave of success ever since. The third generation of the market-leading model stands out as a new benchmark in its segment. Bigger and roomier, Clio III places the accent on driving pleasure...

...on driving pleasure thanks to its dynamic... as offering a further illustration of Renault's in the spirit of Clio II. Dynamic, elegant refinements. In all domains, it boasts features while maintaining a compact design which...

**The power of seduction**

# Augmenting Human Cognition

WWW publishing

The screenshot shows the homepage of DoSomething.org. At the top, there's a navigation bar with icons for help, chat, calendar, phone, and email, along with a search bar and 'GO' button. Below this is a blue banner with the text 'MEMBERS ONLY FIND YOUR CAUSE START SOMETHING AWESOME-THINGS'. The main content area features a large photo of a group of people holding bags of food, with the text 'Food for the people! Collect and donate food to help the homeless.' and a yellow 'Do This' button. On the left, there's a 'Become a Member' section with a 'Connect thru Facebook' button, a form for 'First Name', 'Last Name', 'Cell Number or E-mail', and 'Over 13?' with dropdowns for 'mm', 'dd', and 'yyyy', and a 'SUBMIT' button. Below this is a 'Why become a member?' section and an 'Already a member?' section with 'LOG IN' buttons. At the bottom, there are three columns: 'Twitter Feed' with a list of recent activity, 'Make an Impact' with a form for 'What Cause?' (Education...), 'Who With?' (Friends...), 'Where?' (School...), and 'How Long?' (1 Minute...), and 'News & Stuff' with three articles: 'Free ways to quit smoking', 'Facts about famine', and 'Prevent melting'.

We're here to help

search GO Log in Connect

MEMBERS ONLY FIND YOUR CAUSE START SOMETHING AWESOME-THINGS

## DO SOMETHING .ORG

### Become a Member

Connect thru Facebook

or

First Name Last Name

Cell Number or E-mail

Over 13? mm dd yyyy

SUBMIT

Why become a member?

Already a member?

LOG IN LOG IN

### Food for the people!

Collect and donate food to help the homeless.

## Do This

### Twitter Feed

Recent Activity

Matt Collman shared a link [Meditation](#)

Kevin DiBiase I would like to partner with someone [Read More](#)

Tracy Fink shared a link [Meditation](#)

Stefany Northcutt Sharing experience, strength, and hope!

### Make an Impact

Ready to take action? Choose from the options below and we'll find a whole bunch of Somethings for you to do.

What Cause? Education...

Who With? Friends...

Where? School...

How Long? 1 Minute...

SUBMIT

### News & Stuff

Free ways to quit smoking  
Chocolate and other tactics you didn't think of

Facts about famine  
It's not just about rainfall or farmland

Prevent melting  
Unique ideas for staying cool during a hot summer day

# Augmenting Human Cognition

## Knowledge Communities

### WIKIPEDIA

#### English

*The Free Encyclopedia*

3 543 000+ articles

#### 日本語

フリー百科事典

730 000+ 記事

#### Deutsch

*Die freie Enzyklopädie*

1 181 000+ Artikel

#### Français

*L'encyclopédie libre*

1 061 000+ articles

#### Italiano

*L'enciclopedia libera*

768 000+ voci



#### Español

*La enciclopedia libre*

710 000+ artículos

#### Русский

*Свободная энциклопедия*

654 000+ статей

#### Português

*A enciclopédia livre*

669 000+ artigos

#### Polski

*Wolna encyklopedia*

769 000+ haseł

#### Nederlands

*De vrije encyclopedie*

668 000+ artikelen

# Augmenting Human Cognition

North Korea Uncovered



# Human Computer Interaction

Apple's iPad



Integrated Circuit

GPS



Zoomable

Touchscreen

Multi-touch

# Deconstructing the iPad

## Touchscreens



**NASA and Library of Congress funding in late '80s/early '90s**

- For information access
- To avoid mice in space



Jobs visits UMD 1988

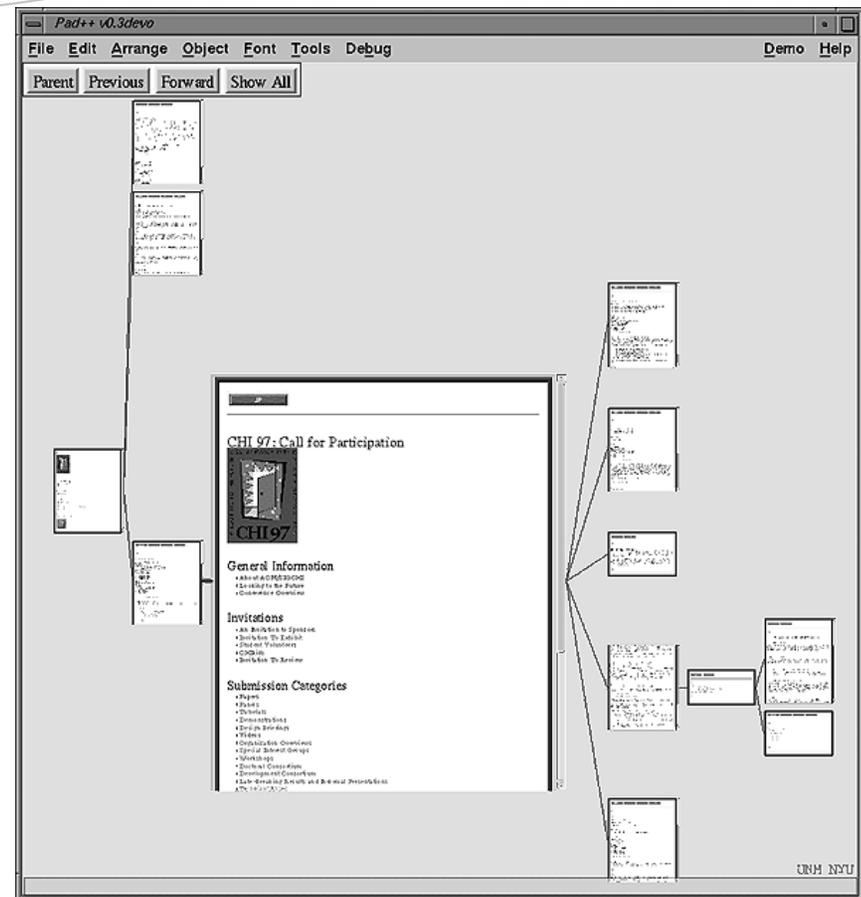
# Deconstructing the iPad

## Zoomable User Interfaces

**DARPA funding in mid '90s**

Command Post of the Future

New desktop & document management



# Deconstructing the iPad

## Multi-touch Gestures

### Long History:

1972 PLATO – Univ. Illinois

Army-Navy-Airforce =>

NSF funding

1985 Sensor Frame – CMU

NASA SBIR

1998 Fingerworks – U. Delaware

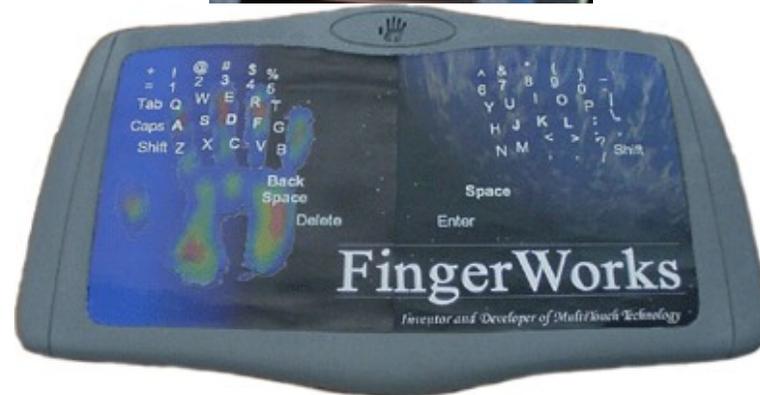
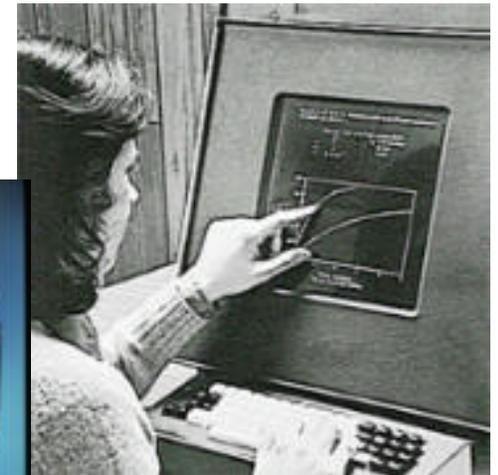
NSF Grad Fellowship –

Wayne Westerman

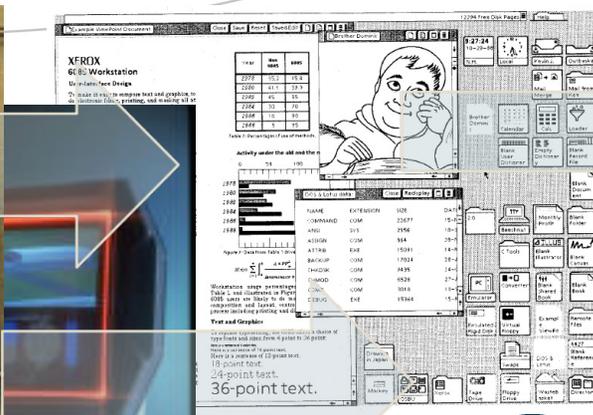
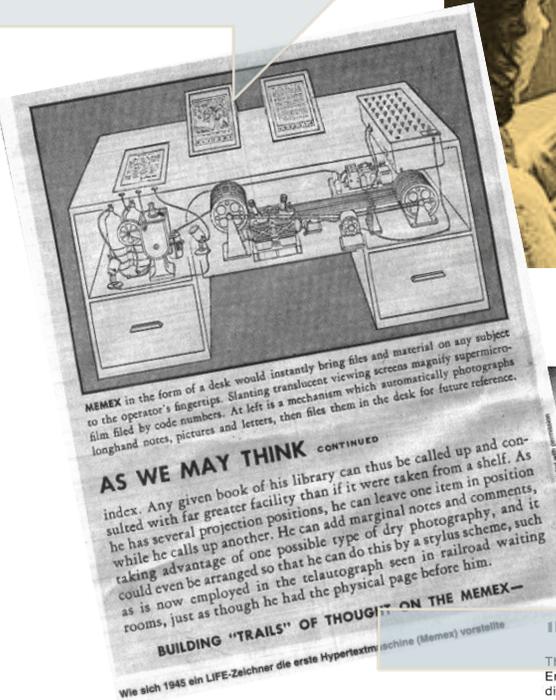
NSF Research Grant –

John Elias

=> **2005 Bought by Apple**



# The Legacy is clear...



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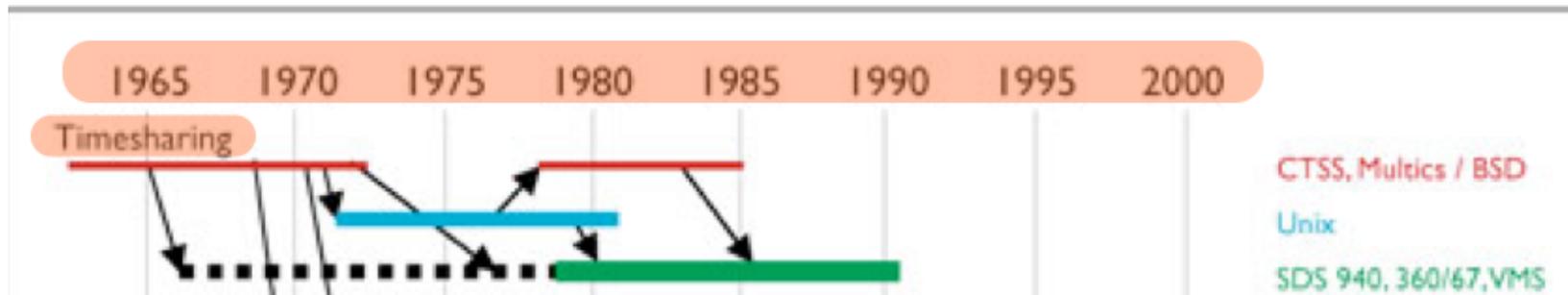


WIKIPEDIA

Google



# The Legacy is clear...



**Red Line** - research in universities

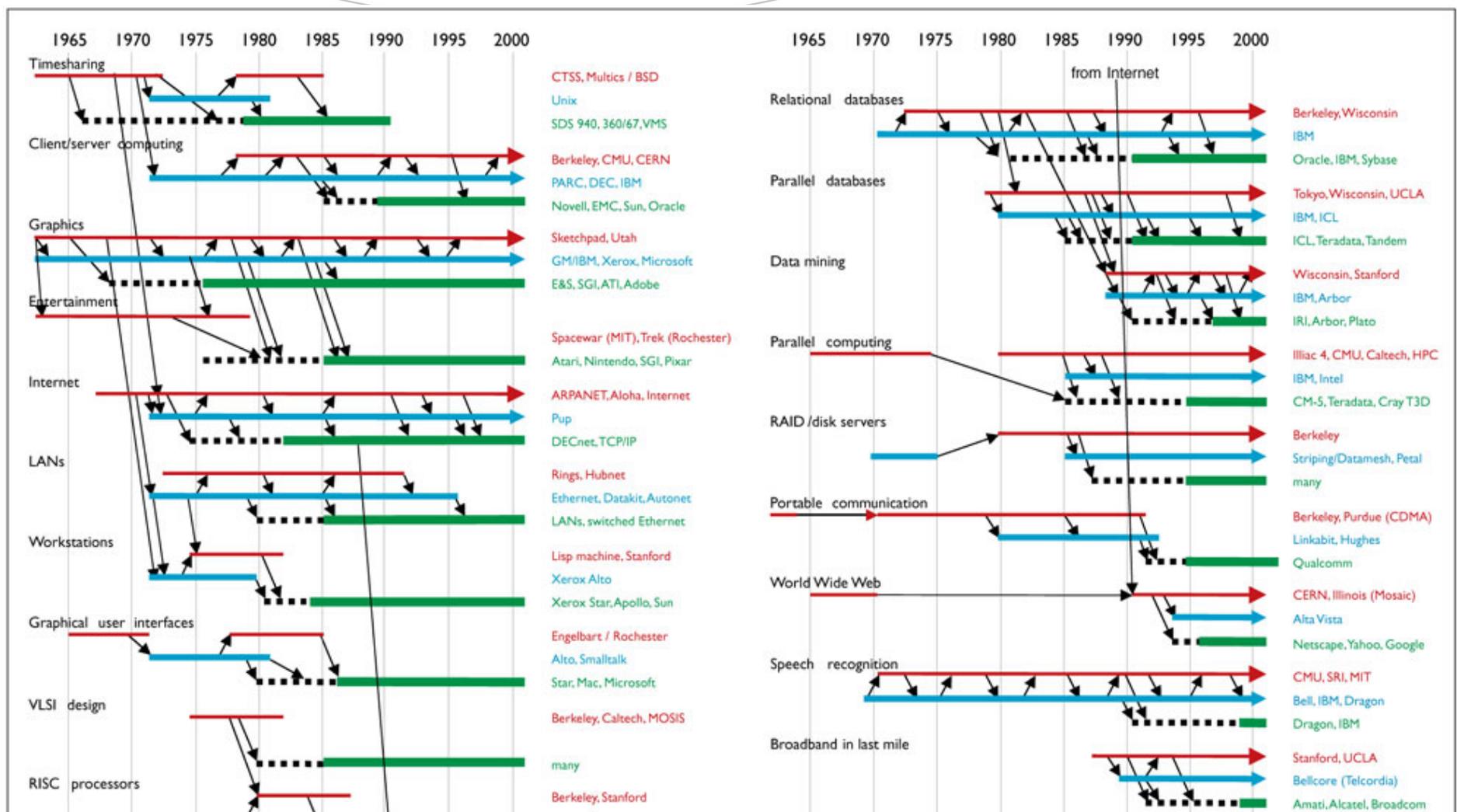
**Blue Line** - research in industry

**Dotted Black Line** - first product

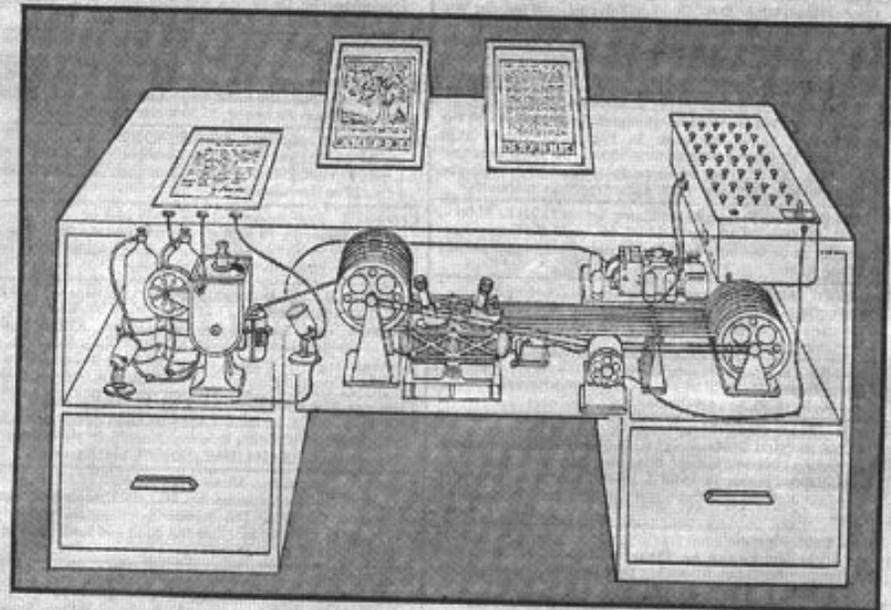
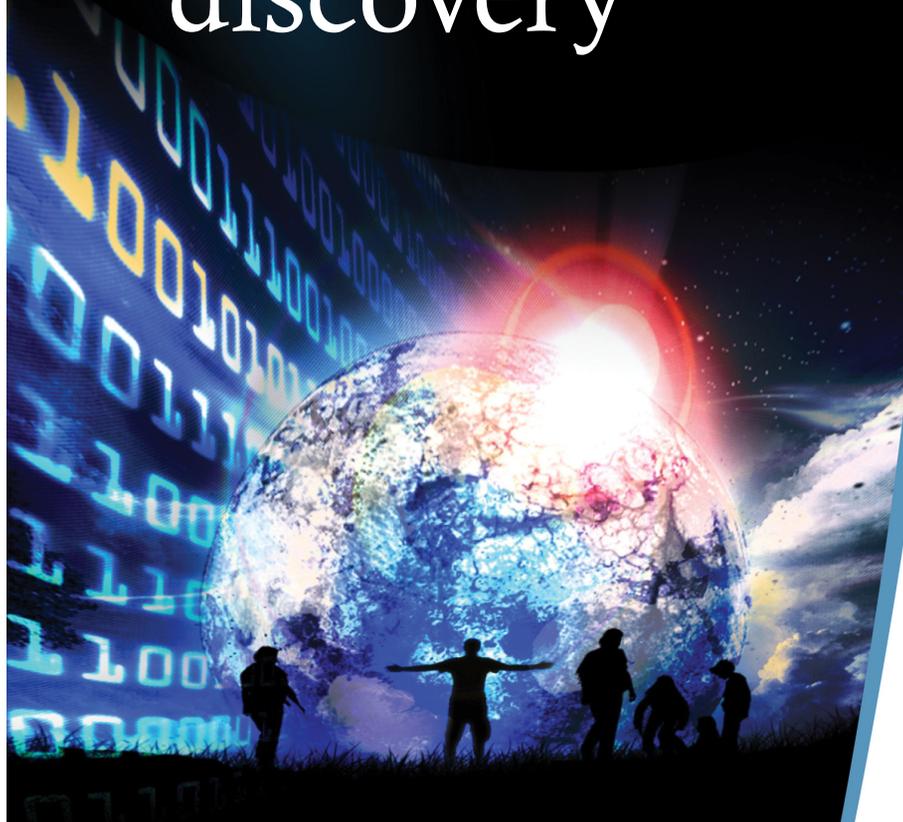
**Solid Green Line** - billion dollar sector

Arrows - flow of people and ideas

# The Legacy is clear...



# On the horizon... the era of discovery



MEMEX in the form of a desk would instantly bring files and material on any subject to the operator's fingertips. Slanting translucent viewing screens magnify supermicrofilm filed by code numbers. At left is a mechanism which automatically photographs longhand notes, pictures and letters, then files them in the desk for future reference.

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## BUILDING "TRAILS" OF THOUGHT ON THE MEMEX—

Wie sich 1945 ein LIFE-Zeichner die erste Hypertextmaschine (Memex) vorstellte

# Discovering the keys to disease treatment

The screenshot shows the homepage of the website 'patientslikeme'. The header features the logo and tagline 'Patients helping patients live better every day.' Below the header is a navigation bar with icons for Patients, Treatments, Symptoms, and Research, along with a search bar and links for Help and Crisis. The main content area is divided into three columns: 'Learn', 'Find', and 'Share'. The 'Learn' column shows a sidebar with 'Celebrate' and 'What we've learned'. The 'Find' column shows a 'Patient Profile' for 'alisking101' with a graph. The 'Share' column has three call-to-action buttons: 'Share Your Experience', 'Find Patients Like You', and 'Learn From Others', each with a 'Join Now (It's free!)' button. Below this is a row of member photos with a 'Click on member photos for more details' link. The bottom section is titled 'Our Current Communities' and lists various conditions under 'Neurological Conditions' and 'Neuroendocrine Conditions'. A 'Highlights' section features a 'New!' star and a callout for the 'Fibromyalgia Community'.

patientslikeme™ Patients helping patients live better every day.

Patients | Treatments | Symptoms | Research

Search this site Search Help | Crisis

Learn Find Share

**Share Your Experience »**  
See how easy it is...

**Find Patients Like You »**  
Try it out...

**Learn From Others »**  
Discover the power of many...

**Join Now (It's free!)**  
Already a member? Log in

Click on member photos for more details

**Our Current Communities**

Neurological Conditions  
MS (Multiple Sclerosis)  
Parkinson's Disease  
ALS (Amyotrophic Lateral Sclerosis) /  
MND (Motor Neuron Disease)  
PLS (Primary Lateral Sclerosis)  
PMA (Progressive Muscular Atrophy)  
PSP (Progressive Supranuclear  
Palsy)

Neuroendocrine Conditions  
**Fibromyalgia (New!)**  
Mood Conditions  
Depression  
Anxiety  
Bipolar  
OCD (Obsessive-Compulsive  
Disorder)

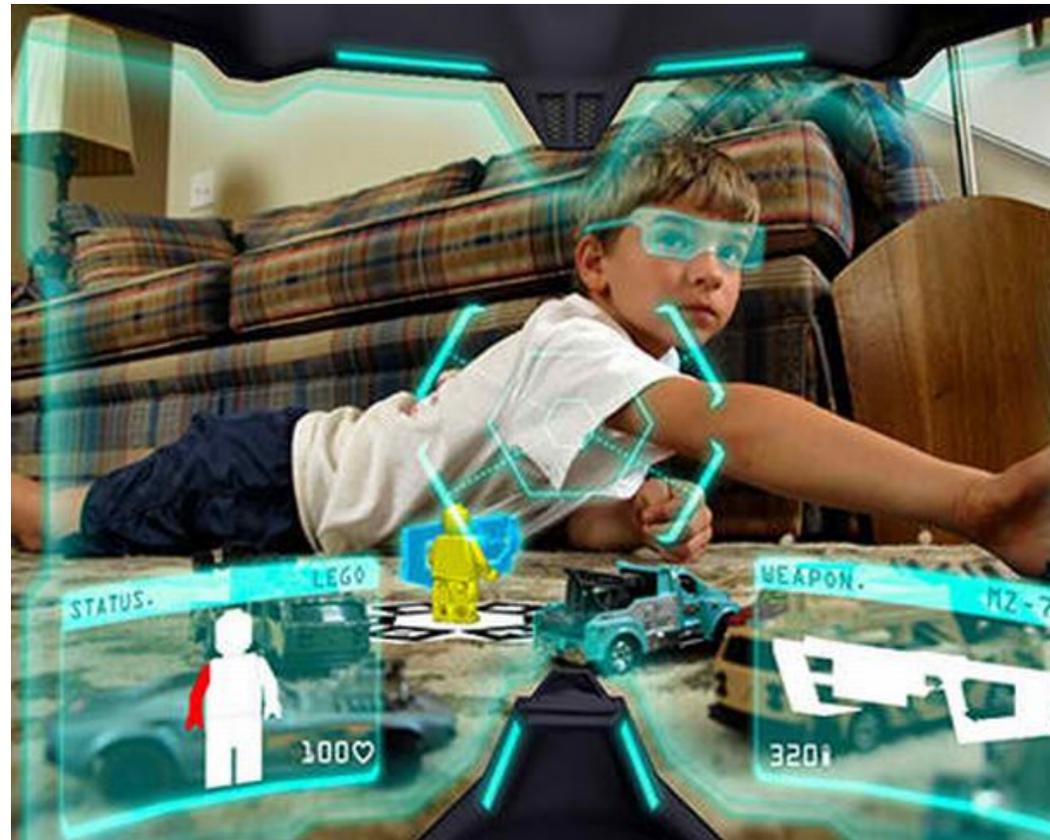
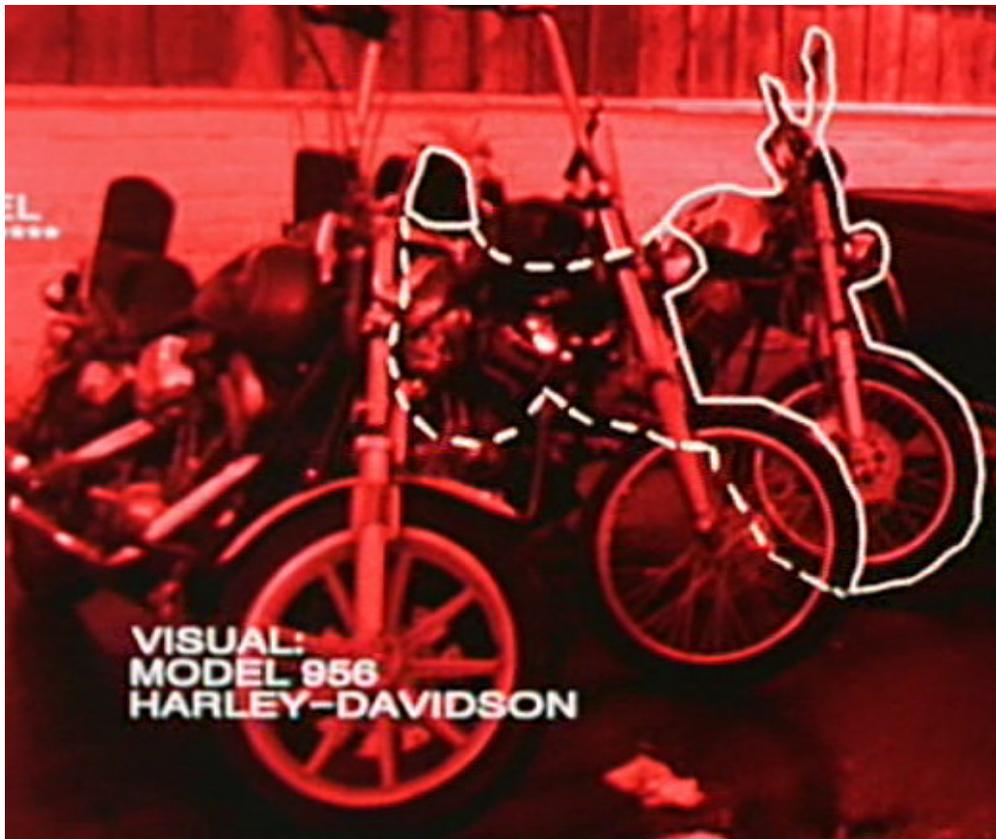
**Highlights**

**Fibromyalgia Community**  
Introducing our new community  
for Fibromyalgia patients like you.  
[Learn more...](#)

# Discovering the keys to disease treatment



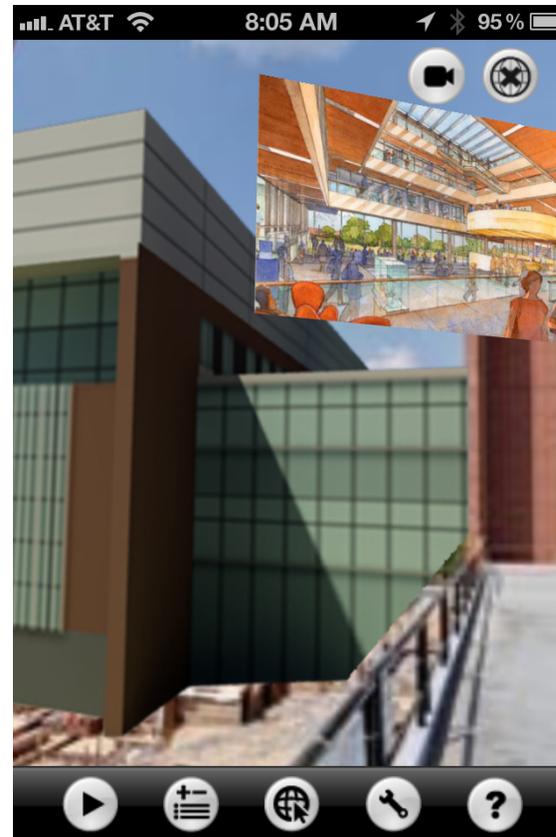
# Mixed reality interaction for discovery



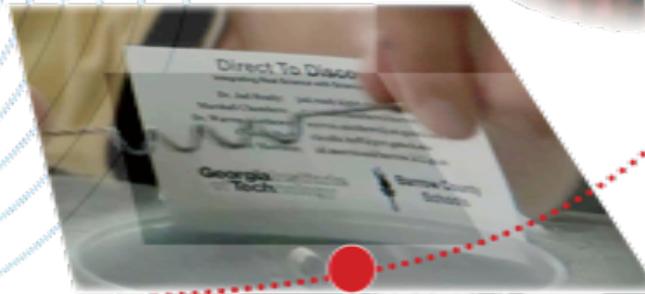
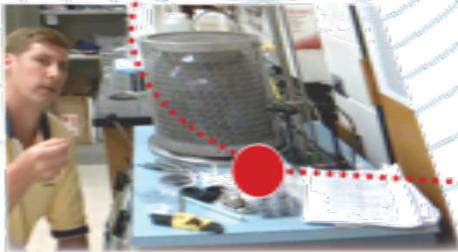
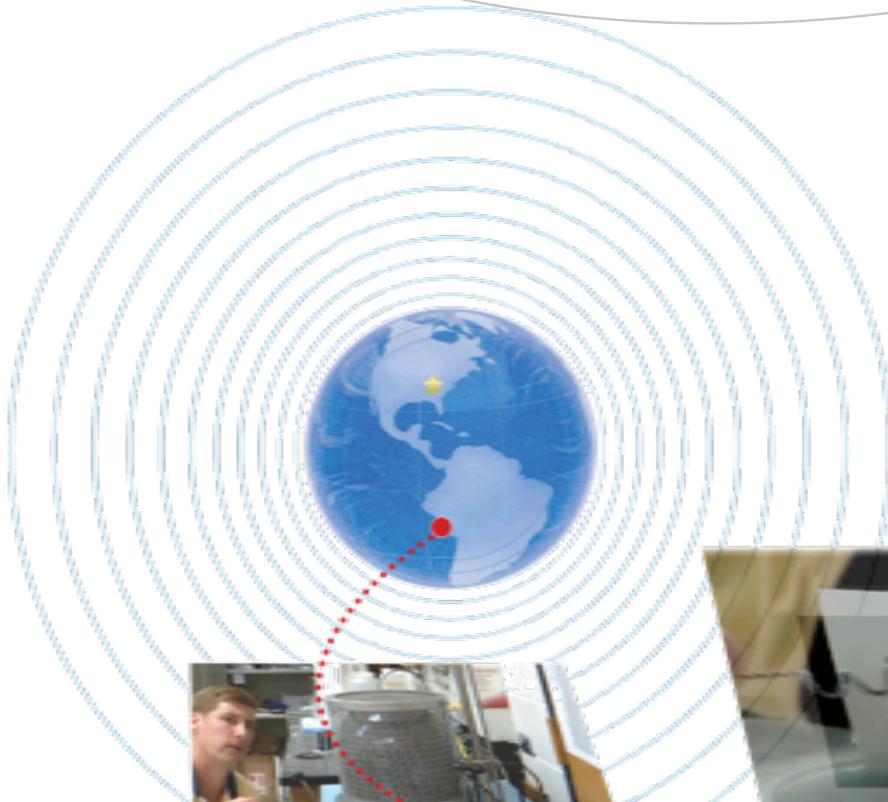
# Mixed reality interaction for discovery



# Mixed reality interaction for discovery



# Learning as discovery



# Investing in the era of discovery



**New technologies for data  
acquisition**

**New techniques for data  
analytics**

**New interaction and  
visualization paradigms**

**New methods for  
collaboration and  
knowledge creation**

**New strategies for  
education**



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